049917F0 J070F02

#6

SEQUENCE LISTING

<110> Dunn-Coleman, Nigel
     Langdon, Timothy
     Morse, Phillip

<120> Manipulation of the Phenolic Acid
  Content and Digestibility of Plant Cell Walls by Targeted
  Expression of Genes Encoding Cell Wall Degrading Enzymes

<130> GC648-2

<140> US 09/991,209
<141> 2001-11-16

<150> US 60/249,608
<151> 2000-11-17

<160> 97

<170> FastSEQ for Windows Version 4.0

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<213> Aspergillus niger

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                100                 105                 110
Asn Gly Cys Glu Val His Gly Gly Tyr Tyr Ile Gly Trp Val Ser Val
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Gln Asp Gln Val Glu Ser Leu Val Lys Gln Gln Val Ser Gln Tyr Pro
     130                 135                 140
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145                 150                 155                 160
Ala Leu Thr Ala Ala Gln Leu Ser Ala Thr Tyr Asp Asn Ile Arg Leu
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Tyr Thr Phe Gly Glu Pro Arg Ser Gly Asn Gln Ala Phe Ala Ser Tyr
                180                 185                 190
Met Asn Asp Ala Phe Gln Ala Ser Ser Pro Asp Thr Thr Gln Tyr Phe
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Arg Val Thr His Ala Asn Asp Gly Ile Pro Asn Leu Pro Pro Val Glu
     210                 215                 220
Gln Gly Tyr Ala His Gly Gly Val Glu Tyr Trp Ser Val Asp Pro Tyr
225                 230                 235                 240
Ser Ala Gln Asn Thr Phe Val Cys Thr Gly Asp Glu Val Gln Cys Cys
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<220>
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<212> PRT
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<220>
<223> retention sequence

<400> 5
Ala Ala Ala Glu Pro Leu Lys Asp Glu Leu
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<210> 6
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> retention sequence encoding sequence

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<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> FAE-linker-frameshift sequence

<400> 7
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<210> 8
<211> 48
<212> DNA
<213> Artificial Sequence

<220>
<223> FAE-linker-frameshift sequence

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<211> 41
<212> PRT
<213> Hordeum sp.

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            20   25   30
Ile Arg Pro Val Thr Asp Arg Ala Ala
        35   40

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<211> 134
<212> DNA
<213> Hordeum sp.

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gaccgcgcgg ccgc   134

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<211> 46
<212> PRT
<213> Rattus sp.

<400> 11
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1   5   10   15
Phe Leu Leu Phe Ala Val Ile Cys Val Trp Lys Lys Gly Ser Asp Tyr
            20   25   30
Glu Ala Leu Thr Leu Gln Ala Lys Glu Phe Gln Met Ala Ala
        35   40   45

<210> 12
<211> 149
<212> DNA
<213> Rattus sp.

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caagccaagg agttccaaat ggcggccgc   149

<210> 13
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<212> PRT
<213> Solanum sp.

<220>
<221> VARIANT
<222> (1)...(50)
<223> Xaa = Any Amino Acid

<400> 13

4

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Leu Gly Leu Leu Leu Leu Val Ser Ala Met Glu His Val Asp Ala Lys
            20                  25                  30
Ala Cys Thr Xaa Glu Cys Gly Asn Leu Gly Phe Gly Ile Cys Pro Ala
        35                  40                  45
Ala Ala
    50
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<210> 14
<211> 159
<212> DNA
<213> Solanum sp.

<400> 14
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<212> DNA
<213> Artificial Sequence

<220>
<223> pTP10-1 vector

<400> 15
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gaccgcgcgg ccgcctccac gcagggcatc tccgaagacc tctacagccg tttagtcgaa   180
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cacggtggat attatattgg atgggtctcc gtccaggacc aagtcgagtc gcttgtcaaa   480
cagcaggtta gccagtatcc ggactacgcg ctgaccgtga ccggccackc cctcggcgcc   540
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5

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<212> PRT
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<221> VARIANT
<222> (1)...(311)
<223> Xaa = Any Amino Acid

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Ile Arg Pro Val Thr Asp Arg Ala Ala Ala Ser Thr Gln Gly Ile Ser
         35                  40                  45
Glu Asp Leu Tyr Ser Arg Leu Val Glu Met Ala Thr Ile Ser Gln Ala
     50                  55                  60
Ala Tyr Ala Asp Leu Cys Asn Ile Pro Ser Thr Ile Ile Lys Gly Glu
65                  70                  75                  80
Lys Ile Tyr Asn Ser Gln Thr Asp Ile Asn Gly Trp Ile Leu Arg Asp
                 85                  90                  95
Asp Ser Ser Lys Glu Ile Ile Thr Val Phe Arg Gly Thr Gly Ser Asp
             100                 105                 110
Thr Asn Leu Gln Leu Asp Thr Asp Tyr Thr Leu Thr Pro Phe Asp Thr
         115                 120                 125
Leu Pro Gln Cys Asn Gly Cys Glu Val His Gly Gly Tyr Tyr Ile Gly
     130                 135                 140
Trp Val Ser Val Gln Asp Gln Val Glu Ser Leu Val Lys Gln Gln Val
145                 150                 155                 160
Ser Gln Tyr Pro Asp Tyr Ala Leu Thr Val Thr Gly His Xaa Leu Gly
                 165                 170                 175
Ala Ser Leu Ala Ala Leu Thr Ala Ala Gln Leu Ser Ala Thr Tyr Asp
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Asn Ile Arg Leu Tyr Thr Phe Gly Glu Pro Arg Ser Gly Asn Gln Ala
         195                 200                 205
Phe Ala Ser Tyr Met Asn Asp Ala Phe Gln Ala Ser Ser Pro Asp Thr
     210                 215                 220
Thr Gln Tyr Phe Arg Val Thr His Ala Asn Asp Gly Ile Pro Asn Leu
225                 230                 235                 240
Pro Pro Val Glu Gln Gly Tyr Ala His Gly Gly Val Glu Tyr Trp Ser
             245                 250                 255
Val Asp Pro Tyr Ser Ala Gln Asn Thr Phe Val Cys Thr Gly Asp Glu
             260                 265                 270
Val Gln Cys Cys Glu Ala Gln Gly Gly Gln Gly Val Asn Asn Ala His
         275                 280                 285
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<212> DNA
<213> Artificial Sequence

<220>
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        35   40   45
Gln Ala Ala Tyr Ala Asp Leu Cys Asn Ile Pro Ser Thr Ile Ile Lys
    50   55   60
Gly Glu Lys Ile Tyr Asn Ser Gln Thr Asp Ile Asn Gly Trp Ile Leu
65   70   75   80
Arg Asp Asp Ser Ser Lys Glu Ile Ile Thr Val Phe Arg Gly Thr Gly
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9

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65                  70                  75                  80
Lys Ile Tyr Asn Ser Gln Thr Asp Ile Asn Gly Trp Ile Leu Arg Asp
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Asp Ser Ser Lys Glu Ile Ile Thr Val Phe Arg Gly Thr Gly Ser Asp
                100                 105                 110
Thr Asn Leu Gln Leu Asp Thr Asn Tyr Thr Leu Thr Pro Phe Asp Thr
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            195                 200                 205
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13

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<221> VARIANT
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<223> Xaa = Any Amino Acid

<400> 22
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         35                  40                  45
Glu Asp Leu Tyr Ser Arg Leu Val Glu Met Ala Thr Ile Ser Gln Ala
     50                  55                  60
Ala Tyr Ala Asp Leu Cys Asn Ile Pro Ser Thr Ile Ile Lys Gly Glu
 65                  70                  75                  80
Lys Ile Tyr Asn Ser Gln Thr Asp Ile Asn Gly Trp Ile Leu Arg Asp
                 85                  90                  95
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14

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Leu Pro Gln Cys Asn Gly Cys Glu Val His Gly Gly Tyr Tyr Ile Gly
        130                 135                 140
Trp Val Ser Val Gln Asp Gln Val Glu Ser Leu Val Lys Gln Gln Val
145                 150                 155                 160
Ser Gln Tyr Pro Asp Tyr Ala Leu Thr Val Thr Gly His Xaa Leu Gly
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Ala Ser Leu Ala Ala Leu Thr Ala Ala Gln Leu Ser Ala Thr Tyr Asp
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Asn Ile Arg Leu Tyr Thr Phe Gly Glu Pro Arg Ser Gly Asn Gln Ala
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Phe Ala Ser Tyr Met Asn Asp Ala Phe Gln Ala Ser Ser Pro Asp Thr
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Pro Pro Val Glu Gln Gly Tyr Ala His Gly Gly Val Glu Tyr Trp Ser
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Val Asp Pro Tyr Ser Ala Gln Asn Thr Phe Val Cys Thr Gly Asp Glu
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<212> DNA
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<220>
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<400> 23
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15

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16

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<213> Artificial Sequence

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<223> Xaa = Any Amino Acid

<400> 24

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        35                  40                  45
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    50                  55                  60
Ala Tyr Ala Asp Leu Cys Asn Ile Pro Ser Thr Ile Ile Lys Gly Glu
65                  70                  75                  80
Lys Ile Tyr Asn Ser Gln Thr Asp Ile Asn Gly Trp Ile Leu Arg Asp
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Asp Ser Ser Lys Glu Ile Ile Thr Val Phe Arg Gly Thr Gly Ser Asp
                100                 105                 110
Thr Asn Leu Gln Leu Asp Thr Asn Tyr Thr Leu Thr Pro Phe Asp Thr
            115                 120                 125
Leu Pro Gln Cys Asn Gly Cys Glu Val His Gly Gly Tyr Tyr Ile Gly
    130                 135                 140
Trp Val Ser Val Gln Asp Gln Val Glu Ser Leu Val Lys Gln Gln Val
145                 150                 155                 160
Ser Gln Tyr Pro Asp Tyr Ala Leu Thr Val Thr Gly His Xaa Leu Gly
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Ala Ser Leu Ala Ala Leu Thr Ala Ala Gln Leu Ser Ala Thr Tyr Asp
            180                 185                 190
Asn Ile Arg Leu Tyr Thr Phe Gly Glu Pro Arg Ser Gly Asn Gln Ala
            195                 200                 205
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    210                 215                 220
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225                 230                 235                 240
Pro Pro Val Glu Gln Gly Tyr Ala His Gly Gly Val Glu Tyr Trp Ser
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305
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17

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<212> DNA
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<220>
<223> pTP5-1 vector

<400> 25
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18

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<223> Xaa = Any Amino Acid

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            35                  40                  45
Leu Cys Asn Ile Pro Ser Thr Ile Ile Lys Gly Glu Lys Ile Tyr Asn
        50                  55                  60
Ser Gln Thr Asp Ile Asn Gly Trp Ile Leu Arg Asp Asp Ser Ser Lys
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19

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Asn Gly Cys Glu Val His Gly Gly Tyr Tyr Ile Gly Trp Val Ser Val
            115                       120                       125
Gln Asp Gln Val Glu Ser Leu Val Lys Gln Gln Val Ser Gln Tyr Pro
        130                       135                       140
Asp Tyr Ala Leu Thr Val Thr Gly His Xaa Leu Gly Ala Ser Leu Ala
145                       150                       155                       160
Ala Leu Thr Ala Ala Gln Leu Ser Ala Thr Tyr Asp Asn Ile Arg Leu
                165                       170                       175
Tyr Thr Phe Gly Glu Pro Arg Ser Gly Asn Gln Ala Phe Ala Ser Tyr
                180                       185                       190
Met Asn Asp Ala Phe Gln Ala Ser Ser Pro Asp Thr Thr Gln Tyr Phe
            195                       200                       205
Arg Val Thr His Ala Asn Asp Gly Ile Pro Asn Leu Pro Pro Val Glu
        210                       215                       220
Gln Gly Tyr Ala His Gly Gly Val Glu Tyr Trp Ser Val Asp Pro Tyr
225                       230                       235                       240
Ser Ala Gln Asn Thr Phe Val Cys Thr Gly Asp Glu Val Gln Cys Cys
                245                       250                       255
Glu Ala Gln Gly Gly Gln Gly Val Asn Asn Ala His Thr Thr Tyr Phe
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<212> DNA
<213> Artificial Sequence

<220>
<223> pTP4a2 vector

<400> 27

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20

21

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<211> 209
<212> PRT
<213> Artificial Sequence

<220>
<223> pTP4a2 vector

<221> VARIANT
<222> (1)...(209)
<223> Xaa = Any Amino Acid

<400> 28
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Pro Phe Asp Thr Leu Pro Gln Cys Asn Gly Cys Glu Val His Gly Gly
        35                  40                  45
Tyr Tyr Ile Gly Trp Val Ser Val Gln Asp Gln Val Glu Ser Leu Val
    50                  55                  60
Lys Gln Gln Val Ser Gln Tyr Pro Asp Tyr Ala Leu Thr Val Thr Gly
65                  70                  75                  80
His Xaa Leu Gly Ala Ser Leu Ala Ala Leu Thr Ala Ala Gln Leu Ser
            85                  90                  95
Ala Thr Tyr Asp Asn Ile Arg Leu Tyr Thr Phe Gly Glu Pro Arg Ser
            100                 105                 110
Gly Asn Gln Ala Phe Ala Ser Tyr Met Asn Asp Ala Phe Gln Ala Ser
        115                 120                 125
Ser Pro Asp Thr Thr Gln Tyr Phe Arg Val Thr His Ala Asn Asp Gly
    130                 135                 140
Ile Pro Asn Leu Pro Pro Val Glu Gln Gly Tyr Ala His Gly Gly Val
145                 150                 155                 160
Glu Tyr Trp Ser Val Asp Pro Tyr Ser Ala Gln Asn Thr Phe Val Cys
                165                 170                 175
Thr Gly Asp Glu Val Gln Cys Cys Glu Ala Gln Gly Gly Gln Gly Val
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<210> 29
<211> 5338
<212> DNA
<213> Artificial Sequence

<220>
<223> pTP3-1 vector

<400> 29

22

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23

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Lys Ile Tyr Asn Ser Gln Thr Asp Ile Asn Gly Trp Ile Leu Arg Asp
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24

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26

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32

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35

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37

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Gly Glu Lys Ile Tyr Asn Ser Gln Thr Asp Ile Asn Gly Trp Ile Leu
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cataccaaac gacgagcgtg acaccacgat gcctgtagca atggcaacaa cgttgcgcaa   2640
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ccaagtttac tcatatatac tttagattga tttaaaactt catttttaat ttaaaaggat   3000
ctaggtgaag atcctttttg ataatctcat gaccaaaatc ccttaacgtg agttttcgtt   3060
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gcgcgtaatc tgctgcttgc aaacaaaaaa accaccgcta ccagcggtgg tttgtttgcc   3180
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gcctacatac ctcgctctgc taatcctgtt accagtggct gctgccagtg gcgataagtc   3360
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cctggccttt tgctggcctt ttgctcacat gttctttcct gcgttatccc ctgattctgt   3780
ggataaccgt attaccgcct ttgagtgagc tgataccgct cgccgcagcc gaacgaccga   3840
gcgcagcgag tcagtgagcg aggaagcgga agagcgccca atacgcaaac cgcctctccc   3900
cgcgcgttgg ccgattcatt aatgcagctg gcacgacagg tttcccgact ggaaagcggg   3960
cagtgagcgc aacgcaatta atgtgagtta gctcactcat taggcacccc aggctttaca   4020
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ccaaaataaa acaaaggtaa gattacctgg tcaaaagtga aaacatcagt taaaaggtgg   4260
tataagtaaa atatcggtaa taaaaggtgg cccaaagtga aatttactct tttctactat   4320
tataaaaatt gaggatgttt tgtcggtact ttgatacgtc attttttgtat gaattggttt   4380
ttaagtttat tcgcgatttg gaaatgcata tctgtatttg agtcggtttt taagttcgtt   4440
gctttttgtaa atacagaggg atttgtataa gaaatatctt taaaaaccc atatgctaat   4500
ttgacataat ttttgagaaa aatatatatt caggcgaatt ccacaatgaa caataataag   4560
attaaaatag cttgcccccg ttgcagcgat gggtattttt tctagtaaaa taaaagataa   4620
acttagactc aaaacatttta caaaaacaac ccctaaagtc ctaaagccca aagtgctatg   4680
cacgatccat agcaagccca gcccaaccca acccaaccca acccaccccca gtgcagccaa   4740
```

41

```
ctggcaaata gtctccaccc ccggcactat caccgtgagt tgtccgcacc accgcacgtc   4800
tcgcagccaa aaaaaaaaaa agaaagaaaa aaaagaaaaa gaaaacagc aggtgggtcc     4860
gggtcgtggg ggccggaaaa gcgaggagga tcgcgagcag cgacgaggcc cggccctccc    4920
tccgcttcca aagaaacgcc ccccatcgcc actatataca tacccccccc tctcctccca    4980
tcccccaac cctaccacca ccaccaccac cacctcctcc ccctcgctg ccggacgacg       5040
agctcctccc ccctcccccct ccgccgccgc cggtaaccac cccgcccctc tcctctttct    5100
ttctccgttt tttttttcgt ctcggtctcg atctttggcc ttggtagttt gggtgggcga    5160
gagcggcttc gtcgcccaga tcggtgcgcg ggaggggcgg gatctcgcgg ctggcgtctc    5220
cgggcgtgag tcggcccgga tcctcgcggg gaatggggct ctcggatgta gatcttcttt    5280
ctttcttctt tttgtggtag aatttgaatc cctcagcatt gttcatcggt agttttttct    5340
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```

<210> 42
<211> 301
<212> PRT
<213> Artificial Sequence

<220>
<223> pTP11-1 vector

<221> VARIANT
<222> (1)...(301)
<223> Xaa = Any Amino Acid

<400> 42

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 1               5                  10                  15
Ala Ala Val Ala Val Ala Ser Ser Ser Ser Phe Ala Asp Ser Asn Pro
                20                  25                  30
Ile Arg Pro Val Thr Asp Arg Ala Ala Ala Ser Thr Gln Gly Ile Ser
            35                  40                  45
Glu Asp Leu Tyr Ser Arg Leu Val Glu Met Ala Thr Ile Ser Gln Ala
        50                  55                  60
Ala Tyr Ala Asp Leu Cys Asn Ile Pro Ser Thr Ile Ile Lys Gly Glu
65                  70                  75                  80
Lys Ile Tyr Asn Ser Gln Thr Asp Ile Asn Gly Trp Ile Leu Arg Asp
                85                  90                  95
Asp Ser Ser Lys Glu Ile Ile Thr Val Phe Arg Gly Thr Gly Ser Asp
                100                 105                 110
Thr Asn Leu Gln Leu Asp Thr Asn Tyr Thr Leu Thr Pro Phe Asp Thr
            115                 120                 125
Leu Pro Gln Cys Asn Gly Cys Glu Val His Gly Gly Tyr Tyr Ile Gly
        130                 135                 140
Trp Val Ser Val Gln Asp Gln Val Glu Ser Leu Val Lys Gln Gln Val
145                 150                 155                 160
Ser Gln Tyr Pro Asp Tyr Ala Leu Thr Val Thr Gly His Xaa Leu Gly
                165                 170                 175
Ala Ser Leu Ala Ala Leu Thr Ala Ala Gln Leu Ser Ala Thr Tyr Asp
                180                 185                 190
Asn Ile Arg Leu Tyr Thr Phe Gly Glu Pro Arg Ser Gly Asn Gln Ala
            195                 200                 205
Phe Ala Ser Tyr Met Asn Asp Ala Phe Gln Ala Ser Ser Pro Asp Thr
        210                 215                 220
Thr Gln Tyr Phe Arg Val Thr His Ala Asn Asp Gly Ile Pro Asn Leu
225                 230                 235                 240
Pro Pro Val Glu Gln Gly Tyr Ala His Gly Gly Val Glu Tyr Trp Ser
                245                 250                 255
Val Asp Pro Tyr Ser Ala Gln Asn Thr Phe Val Cys Thr Gly Asp Glu
                260                 265                 270
Val Gln Cys Cys Glu Ala Gln Gly Gly Gln Gly Val Asn Asn Ala His
```

```
                 275                   280                   285
     Thr Thr Tyr Phe Gly Met Thr Ser Gly Ala Cys Thr Trp
         290                   295                   300
```

<210> 43
<211> 1259
<212> DNA
<213> Artificial Sequence

<220>
<223> actin promoter

<400> 43
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ggtaccgggc cccccctcga ggtcattcat atgcttgaga agagagtcgg gatagtccaa    60
aataaaacaa aggtaagatt acctggtcaa aagtgaaaac atcagttaaa aggtggtata   120
agtaaaatat cggtaataaa aggtggccca aagtgaaatt tactctttc tactattata   180
aaaattgagg atgtttgtc ggtactttga tacgtcattt ttgtatgaat tggttttta   240
gtttattcgc gatttggaaa tgcatatctg tatttgagtc ggttttttaag ttcgttgctt   300
ttgtaaatac agagggattt gtataagaaa tatctttaaa aaacccatat gctaatttga   360
cataattttt gagaaaaata tatattcagg cgaattccac aatgaacaat aataagatta   420
.aaatagcttg cccccgttgc agcgatgggt attttttcta gtaaataaa agataaactt   480
agactcaaaa catttacaaa aacaacccct aaagtcctaa agcccaaagt gctatgcacg   540
atccatagca agcccagccc aacccaaccc aacccaaccc accccagtgc agccaactgg   600
caaatagtct ccaccccgg cactatcacc gtgagttgtc cgcaccaccg cacgtctcgc   660
agccaaaaaa aaaaaaagaa agaaaaaaa gaaaaagaaa aacagcaggt gggtccgggt   720
cgtgggggcc ggaaaagcga ggaggatcgc gagcagcgac gaggcccggc cctccctccg   780
cttccaaaga aacgcccccc atcgccacta tatacatacc cccccctctc ctcccatccc   840
cccaaccta ccaccaccac caccaccacc tcctcccccc tcgctgccgg acgacgagct   900
cctccccct cccctccgc cgccgccggt aaccacccg cccctctcct cttctttct   960
ccgttttttt tttcgtctcg gtctcgatct ttggccttgg tagtttgggt gggcgagagc  1020
ggcttcgtcg cccagatcgg tgcgcgggag gggcgggatc tcgcggctgg cgtctccggg  1080
cgtgagtcgg cccggatcct cgcggggaat ggggctctcg gatgtagatc ttctttcttt  1140
cttcttttttg tggtagaatt tgaatccctc agcattgttc atcggtagtt tttctttca  1200
tgatttgtga caaatgcagc ctcgtgcgga gctttttttgt aggtagaagc ttaccatgg  1259
```

<210> 44
<211> 27
<212> PRT
<213> Artificial Sequence

<220>
<223> aleurain-NPIR delete structure

<400> 44
```
Met Ala His Ala Arg Val Leu Leu Leu Ala Leu Ala Val Leu Ala Thr
  1               5                  10                  15
Ala Ala Val Ala Val Ala Ser Ser Arg Ala Ala
             20                  25
```

<210> 45
<211> 93
<212> DNA
<213> Artificial Sequence

<220>
<223> aleurain-NPIR delete structure encoding sequence

<400> 45
```
aagcttacca tggcccacgc ccgcgtcctc ctcctggcgc tcgccgtgct ggccacggcc    60
gccgtcgccg tcgcctcctc ccgcgcggcc gcc                                  93
```

```
<210> 46
<211> 873
<212> DNA
<213> Artificial Sequence

<220>
<223> SEE1 (senescence enhanced) promoter

<400> 46
catgggccag gtataattat gggatatctc aagcaaataa tcgaaatatc accattggct      60
acaatatctg agctccgagt tctgactgca gtctggatga cgcgtgttgt atctagaact     120
ctagatagca cagccacagc acctacagga gtgcgacact tgtggactgt agtagtgttg     180
gagacggagc tctttcctac ctcctgacgt tgccgccgtt gtccattcca acggcatcac     240
tctcaaccaa tcacgcgctc ccaacaaaat atcgtccccc atgtcttggc ggagagagag     300
tacatacatg ctgtcgcgcc gtttttgtct gaatctcgct tccactggcc aatcagctca     360
gctcccggga gctcactcat tcaagatccc atcgtcgtcg tcacccctgg cgtcatggga     420
tggaaaagaa cctccgttgc tcggatgagt cagccatatc cccgaacaga gtactgcaag     480
ataacccaat tcagattccc ccaatagaga aagtatagca tgctttcggg ttttgtttgg     540
cttaattgac tttatttttg ttggagttga atgctgattt gttgtgtaaa atgcccaacc     600
atctgaatat cgagacggat aataggctgg ctaattaatt tatagcaaga ttctgtagtg     660
cacatcgcaa atatctttct gggcattaca gctggaggct tcatcagcct gaaacactct     720
gcagagcctg aagcaagtgg tgaagcgtgg cgatgagatg ggtataaaac ccccggcacc     780
gggacgcgag ctcccgccta ccagtaccat ctcgcctcgc tccccctgcc ggacgaccca     840
gtaaaatact gttgcccact cgccggcgag atg                                   873

<210> 47
<211> 39
<212> PRT
<213> Artificial Sequence

<220>
<223> SEE1 promoter plus vacuolar aleurain signal/NPIR
      sequence

<400> 47
Met Ala His Gly Arg Ile Leu Phe Leu Ala Leu Ala Val Leu Ala Thr
 1               5                   10                  15
Ala Ala Val Ala Ala Ala Ser Leu Ala Asp Ser Asn Pro Ile Arg Pro
            20                  25                  30
Val Thr Glu Arg Ala Ala Ala
        35

<210> 48
<211> 987
<212> DNA
<213> Artificial Sequence

<220>
<223> SEE1 promoter plus vacuolar aleurain signal/NPIR
      encoding sequence

<221> misc_feature
<222> (1)...(987)
<223> n = A,T,C or G

<400> 48
catgggccag gtataattat gggatatctc aagcaaataa tcgaaatatc accattggct      60
acaatatctg agctccgagt tctgactgca gtctggatga cgcgtgttgt atctagaact     120
ctagatagca cagccacagc acctacagga gtgcgacact tgtggactgt agtagtgttg     180
```

```
gagacggagc tctttcctac ctcctgacgt tgccgccgtt gtccattcca acggcatcac      240
tctcaaccaa tcacgcgctc ccaacaaaat atcgtccccc atgtcttggc ggagagagag      300
tacatacatg ctgtcgcgcc gttttttgtct gaatctcgct tccactggcc aatcagctca      360
gctcccggga gctcactcat tcaagatccc atcgtcgtcg tcacccctgg cgtcatggga      420
tggaaaagaa cctccgttgc tcggatgagt cagccatatc cccgaacaga gtactgcaag      480
ataacccaat tcagattccc ccaatagaga aagtatagca tgctttcggg ttttgtttgg      540
cttaattgac tttattttttg ttggagttga atgctgattt gttgtgtaaa atgcccaacc      600
atctgaatat cgagacggat aataggctgg ctaattaatt tatagcaaga ttctgtagtg      660
cacatcgcaa atatctttct gggcattaca gctggaggct tcatcagcct gaaacactct      720
gcagagcctg aagcaagtgg tgaagcgtgg cgatgagatg ggtataaaac ccccggcacc      780
gggacgcgag ctcccgccta ccagtaccat ctcgcctcgc tccccctgcc ggacgaccca      840
gtaaaatact gttgcccact cgccggcgag atgggcccacg gccgcatcct cttcttggcg      900
ctcgccgtct tggccaccgc cgcggtggcc gccgcatcnt tggcggactc caacccgatc      960
cggcccgtca ccgagcgcgc ggccgcc                                          987
```

```
<210> 49
<211> 40
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 49
ggcgccgagg gagtggccgg tcacggtcag cgcgtagtcc                            40


<210> 50
<211> 35
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 50
ccggccacgc cctcggcgcc tccctggcgg cactc                                 35


<210> 51
<211> 44
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 51
ctaaagctta ccatggcggc cgcctccacg caggcatct ccga                       44


<210> 52
<211> 50
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 52
tctaagcttg cggccgcgac cggccaggtg catgcgccgc tcgtcatccc                 50


<210> 53
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<211> 325
<212> DNA
<213> Artificial Sequence

<220>
<223> amplified nos terminator sequence from pMA406
      vector

<400> 53
agactgcaga ccatggcggc cgcgkaacca ctgaaggatg agctgtaaag aagcagatcg   60
ttcaaacatt tggcaataaa gtttcttaag attgaatcct gttgccggtc ttgcgatgat   120
tatcatataa tttctgttga attacgttaa gcatgtaata attaacatgt aatgcatgac   180
gttatttatg agatgggttt ttatgattag agtcccgcaa ttatacattt aatacgcgat   240
agaaaacaaa atatagcgcg caaactagga taaattatcg cgcgcggtgt catctatgtt   300
actagatcga taagcttcta gatct   325

<210> 54
<211> 72
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 54
agactgcaga ccatggcggc cgcgkaacca ctgaaggatg agctgtaaag aagcagatcg   60
ttcaaacatt tg   72

<210> 55
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 55
aagactgcag accatggcgg   20

<210> 56
<211> 40
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 56
agatctagaa gcttatcgat ctagtaacat agatgacacc   40

<210> 57
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 57
ctaggcggcc gcgcgggagg aggcgacggc gac   33

46

<210> 58
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 58
gagggtgtat tcggtatcga gttgcaggtt cgtatc   36

<210> 59
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 59
ctcgataccc attacaccct cacgcctttc ga   32

<210> 60
<211> 10
<212> DNA
<213> Artificial Sequence

<220>
<223> AccI site

<400> 60
gtaggtagac   10

<210> 61
<211> 39
<212> DNA
<213> Artificial Sequence

<220>
<223> synthetic oligonucleotide

<400> 61
ctcaccatgg taagcttcta cctacaaaaa agctccgca   39

<210> 62
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 62
aaccatggcg gccgcgcgct cggtgacggg ccggat   36

<210> 63
<211> 29
<212> DNA
<213> Artificial Sequence

47

<220>
<223> primer

<400> 63
ttcggtacca tggccaggta taattatgg   29

<210> 64
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 64
ctgcgccggc gagatggmcg tgcacaagga g   31

<210> 65
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 65
ggaattcgta gacaagctta cmatggccca cgcccgcgtc ct   42

<210> 66
<211> 55
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 66
tatccatggc ggccgcgcgg tcggtgacgg gccggmycgg gttggagtcg gcgaa   55

<210> 67
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 67
ctaggcggcc gcgcgggagg aggcgacggc gac   33

<210> 68
<211> 54
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 68

gcgacggcga cggcggccgt ggccagcacg gcgagcgcca ggaggaggac gcgg   54

<210> 69
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 69
tcgccgtcgc ctcctcctcc tccttcgccg act   33

<210> 70
<211> 43
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 70
actaagctta aggagatata acaatgatcc acaccaacct caa   43

<210> 71
<211> 45
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 71
ttccatgatc cacaccaacc tcaaaaagaa gttctccctc ttcat   45

<210> 72
<211> 55
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 72
agagtgatca cggcgaagag gaggaagacg aggatgaaga gggagaactt ctttt   55

<210> 73
<211> 61
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 73
tatagatctg cgtgtggaag aagggctccg actacgaggc cctcaccctc caagccaagg   60
a   61

<210> 74
<211> 28

<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 74
catttggaac tccttggctt ggagggtg   28

<210> 75
<211> 34
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 75
aaccatggcg gccgccattt ggaactcctt ggct   34

<210> 76
<211> 61
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 76
tatagatctg cgtgtggaag aagggctccg actacgaggc cctcaccctc caagccaagg   60
a   61

<210> 77
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 77
ggaattcgta gacaagctta cmatggmcgt gcacaaggag gt   42

<210> 78
<211> 37
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 78
gatcaggagg taggcwacga agttwacctc cttgtgc   37

<210> 79
<211> 37
<212> DNA
<213> Artificial Sequence

<220>

<223> primer

<400> 79
cctacctcct gatcgtsctc ggcctcctct tgctcgt   37

<210> 80
<211> 43
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 80
ccttggcgtc cacgtgctcc atggcggawa cgagcaagag gag   43

<210> 81
<211> 39
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 81
gtggacgcca aggcctgcac cckcgagtgc ggcaacctc   39

<210> 82
<211> 47
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 82
ggaattcgcg gccgccgggc agatgccgaa gccgaggttg ccgcact   47

<210> 83
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 83
ctaaagctta acatgaagca gttctccgcc aa   32

<210> 84
<211> 8
<212> DNA
<213> Oryza sp.

<400> 84
gtaggtag   8

<210> 85
<211> 7
<212> PRT

<213> Artificial Sequence

<220>
<223> KDEL fusion peptide

<400> 85
Lys Pro Leu Lys Asp Glu Leu
 1   5

<210> 86
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> designated KDEL fusion peptide

<400> 86
Glu Pro Leu Lys Asp Glu Leu
 1   5

<210> 87
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> frameshifted terminal peptide

<400> 87
Glu Thr Thr Glu Gly
 1   5

<210> 88
<211> 27
<212> PRT
<213> Aspergillus niger

<400> 88
Met Lys Gln Phe Ser Ala Lys His Val Leu Ala Val Val Val Thr Ala
 1   5   10   15
Gly His Ala Leu Ala Ala Ser Thr Gln Gly Ile
            20   25

<210> 89
<211> 9
<212> PRT
<213> Aspergillus niger

<400> 89
Met Ala Ala Ala Ser Thr Gln Gly Ile
 1   5

<210> 90
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> ER retention vector

52

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<400> 90
Lys Pro Leu Lys Asp Glu Leu
 1               5


<210> 91
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> c-terminal targeting sequence

<400> 91
Pro Val Ala Ala Ala
 1               5


<210> 92
<211> 55
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 92
tatccatggc ggccgcgcgg tcggtgacgg gccggcccgg gttggagtcg gcgaa          55


<210> 93
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> ferulic esterase end

<400> 93
Cys Thr Trp Pro Val Ala Ala Ala
 1               5


<210> 94
<211> 72
<212> PRT
<213> Artificial Sequence

<220>
<223> pTP4a2 vector

<400> 94
Met Lys Gln Phe Ser Ala Lys His Val Leu Ala Val Val Val Thr Ala
 1               5                   10                  15
Gly His Ala Leu Ala Ala Ser Thr Gln Gly Ile Ser Glu Asp Leu Tyr
            20                  25                  30
Ser Arg Leu Val Glu Met Ala Thr Ile Ser Gln Ala Ala Tyr Ala Asp
        35                  40                  45
Leu Cys Asn Ile Pro Ser Thr Ile Ile Lys Gly Glu Lys Ile Tyr Asn
    50                  55                  60
Ser Gln Thr Asp Ile Asn Gly Trp
65                  70
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53

<210> 95
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> protein encoded by functional reading frame

<400> 95
Tyr Ala Leu Thr Val Thr Gly His Ser Leu Gly Ala Ser Leu Ala Ala
 1   5   10   15
Leu

<210> 96
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> protein encoded by inactivated reading frame

<400> 96
Tyr Ala Leu Thr Val Thr Gly His Ala Leu Gly Ala Ser Leu Ala Ala
 1   5   10   15
Leu

<210> 97
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> retention sequence

<400> 97
Lys Asp Glu Leu
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